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Indian Standard

ELECTRIC WELDING ACCESSORIES — SPECIFICATION

(First Revision)

भारतीय मानक

विद्युत वेल्डिंग सहायकांग — विशिष्टि

(पहला पुनरीक्षण)

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Electric Welding Equipment Sectional Committee, ETDC 21

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 9 March 1989, after the draft finalized by the Electric Welding Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

This standard was first published in 1964 and this revision has been undertaken to make it up to date.

In the preparation of this standard, assistance has been derived from the following:

BS 638 : 1984 Arc welding power sources, equipment and accessories. British Standards Institution.

IEC Document 26 (Secretariat) 36 : 1981 Draft — 'Safety requirements for arc welding equipment-electric holders'. International Electrotechnical Commission (IEC).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

This standard is intended chiefly to cover the technical provisions relating to electric welding accessories, and it does not include all the necessary provisions of a contract.

Indian Standard

ELECTRIC WELDING ACCESSORIES — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard specifies the requirements and tests for electric welding accessories in order to optimize the safety of the operator and to ensure satisfactory conditions of use.

1.2 The accessories covered in this standard are electrode holders and return current clamps for manual arc welding with covered electrodes of length not more than 450 mm.

1.3 This standard does not apply to accessories used for special application, such as, underwater welding.

2 REFERENCES

2.1 The Indian Standard IS 1851 : 1975 'Specification for single operator type arc welding transformers (*second revision*)' is a necessary adjunct to this standard.

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply.

3.1 Clamping Device

The device in which the electrode is inserted and held.

3.2 Continuous Test Current

The current to be passed continuously for the purpose of temperature rise test.

3.3 Electrode Holder

A tool used for clamping and guiding the electrode ensuring electrical connection for the welding current.

3.4 Handle

The part of the electrode holder designed to be held by hand.

3.5 Head

The part of the electrode holder having cavities to house the clamping device.

3.6 Lead

A part used for controlling the clamping device.

3.7 Rated Welding Current

The rated welding current is the maximum continuous hand welding current (*see* **2.6** of IS 1851 : 1975).

3.8 Return Current Clamp

The device used for ensuring electrical connection between return current cable and the work piece.

3.9 Routine Tests

Tests carried out on each item to check requirements which are likely to vary during production.

3.10 Test Load Factor

A factor by which the rated welding current is multiplied to obtain the continuous test current.

3.11 Type Tests

Tests carried out to prove conformity with this specification. These are intended to prove the general quality and design of the given type of accessories.

3.12 Welding Current

The rms value of the current flowing in the welding circuit.

4 NORMAL SERVICE CONDITIONS

4.1 This standard applies for operation under the following climate conditions:

a) Ambient temperature : Not exceeding 40°C, and
b) Altitude : Not exceeding 1000 m.

5 ELECTRODE COLDER

5.1 Rated Current

The preferred rated current shall be 200, 400 and 600 A.

5.2 Design and Construction

5.2.1 Considering the accessibility of the live parts, following two types of electrode holders are specified:

a) *Type A*, fully insulated, suitable for adverse welding conditions like shipbuilding or welding in enclosed conditions, for example, inside vessels.
b) *Type B*, semi-insulated, for general open shop conditions.

5.2.2 *General Requirements*

5.2.2.1 Electrode holder shall be suitable for use on circuits with open circuit voltages up to and including 100 volts (rms).

5.2.2.2 Electrode holder shall be as light as possible. The weight shall be as given below:

Rated Current of Holder	*Max Weight*
A	g
200	500
400	600
600	750

5.2.2.3 Electrode holders shall have the provision for alternative positions for gripping electrodes to avoid the necessity for bending the electrodes when welding in different positions.

5.2.2.4 The design of the electrode holders shall be such that under normal conditions of service, it shall be possible to weld with electrodes in any position in the holder until a stub of only 40 mm in length remains without damage to the holder.

5.2.2.5 In the electrode holder, the device for connecting the welding cable shall ensure satisfactory clamping of the cable of appropriate size with adequate electrical contact without the use of special tools.

5.2.2.6 Cable entry to the electrode holder shall be so designed that the risk of damage due to continual flexing of the cable is kept to a minimum. The insulation of the cable shall enter the holder to a depth not less than 50 mm and provisions shall be made to anchor or clamp the cable to avoid any pull to be transmitted to the joint in normal use.

5.2.2.7 The handle of the electrode holder shall be constructed of or encased in tough heat resisting insulating material and shall be so constructed that no dirt or foreign particles likely to cause danger by electric shock can lodge in joints, holes and other crevices and that the live ends of screws, pins, etc, cannot be exposed in use.

5.2.2.8 Springs, if used in the clamping device, shall be insulated electrically so that they do not carry welding current unless designed to do so.

5.2.2.9 Type A electrode holders shall satisfy the general requirements specified in **5.2.2.1** to **5.2.2.8** and shall be encased in suitable electrical insulating material with the exception of the inner surfaces of the electrode gripping jaws and the spring if it is electrically insulated.

5.2.2.10 In Type A electrode holders, any exposed springs associated with electrode gripping jaws shall be suitably protected from radiated heat and weld spatter.

5.2.2.11 Type B electrode holders shall satisfy the general requirements specified in **5.2.2.1** to **5.2.2.8**. The portion of the lever controlling the clamping device required to be operated during normal use shall be encased in a tough heat resisting insulating material.

5.2.2.12 Type B electrode holders shall be fitted with a guard of insulating material satisfying the requirements for very low flammability given in **5.3.7** to prevent accidental contact with any live or hot part of the holder.

5.2.2.13 The guard shall be at least 4 mm thick and shall project for less than 19 mm around the handle to give reasonable protection to the exposed spring, if any, and the hand from radiated heat and spatter and also to allow the holder with cable connected to be laid on a flat surface without any live part of the holder touching the surface.

5.3 Tests

5.3.1 *Type Tests*

The following shall constitute type tests:

a) Temperature rise test (*see* **5.3.3**),

b) Insulation resistance test (*see* **5.3.4**),

c) High voltage test (*see* **5.3.5**),

d) Test for impact strength (*see* **5.3.6**), and

e) Test for flammability and resistance to heat (*see* **5.3.7**).

5.3.2 *Routine Tests*

Routine tests and their sequence shall be as follows:

a) Insulation resistance test (*see* **5.3.4**), and

b) High voltage test (*see* **5.3.5**).

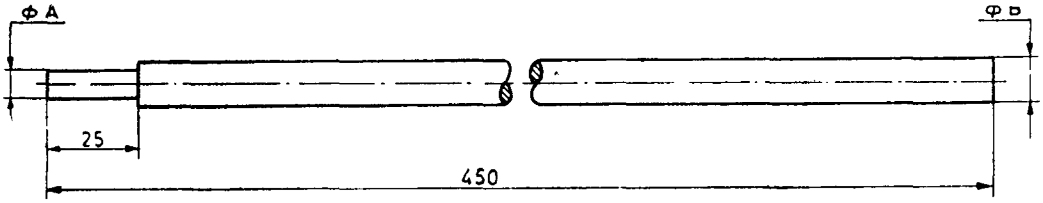
5.3.3 *Temperature Rise Test*

5.3.3.1 This test is to be carried out in a draught free room at a room temperature not exceeding 40°C with as little air movement as possible.

5.3.3.2 For the purpose of this test, a flexible copper welding cable appropriate to the maximum rating of the holder and at least 5 m in length shall be connected to it by the means provided in the design of the holder.

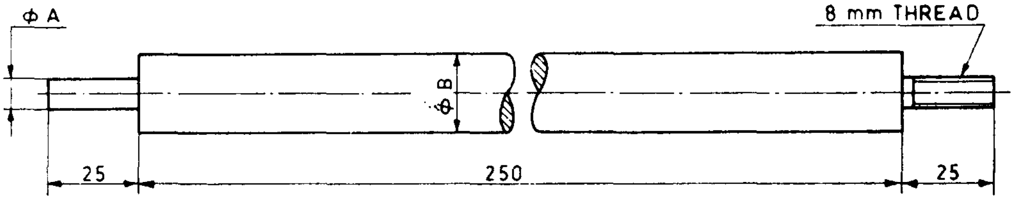
5.3.3.3 An adopter of dimensions shown in Fig. 1 shall be clamped in the clamping device (jaw) of the holder, the other end of the adopter being connected to a return current cable similar to the welding cable by suitable means.

5.3.3.4 For the purpose of measuring the temperature of the outer surface of the handle of the holder, two thermometers or the end of the thermocouples shall be attached to the centre portion of the gripping area of the handle at its outer surface by adhesive tapes or other suitable means.



1A Material : Commercially Pure Aluminium

Rated Current, A	*Dia A*	*Dia B*
200	5·6	5·6
400	8·0	8·0
600	8·0	11·3



1B Material : Mild Steel

Rated Current, A	*Dia A*	*Dia B*
200	6	15
400	8	21
600	8	26

All dimensions in millimetres.

FIG. 1 ADOPTER

5.3.3.5 The bulb of the thermometer or the ends of the thermocouples except at the point of contact, shall be covered with a pad of felt, cotton wool or other non-conducting material, 3 mm thick extending at least 20 mm in every direction from the point of contact to prevent loss of heat by convection or by radiation.

5.3.3.6 The holder and the adopter shall then be placed in a horizontal plane 250 mm above ground and ac current at 50 Hz equal to 60 percent of the rated current of the holder shall be passed continuously. At the end of 2 h, temperature shall be recorded. The mean of two readings shall be taken as the temperature of the handle. The temperature rise shall not exceed 30°C above the ambient temperature. A variation of ± percent in the rated current shall be allowed to take care of the supply voltage fluctuations.

5.3.4 *Insulation Resistance Test*

This test shall be carried out on a new holder.

5.3.4.1 For this test, a metal foil shall be wrapped securely on the insulating materials covering the clamping device of Type A holder and another on the handle within 12·5 mm of the ends in case of both Type A and Type B holders.

5.3.4.2 The insulation resistance shall be measured using a dc voltage of 500 volts. The insulation resistance between the clamping device on the jaws and the metal foil wrapped on the clamping device and between the clamping device and the metal foil wrapped on the handle shall be not less than 1 and 2 megohm, respectively.

5.3.5 *High Voltage Test*

After the insulation resistance test, a voltage of 1 000 volts ac (rms) having a frequency between 40 and 60 Hz is applied for 1 minute between clamping device and the metal foil wrapped on the insulating material covering the clamping device of Type A holder and a voltage of 2 000 volts ac (rms) having a frequency between 40 and 60 Hz is applied for 1 min between the clamping device and the metal foil wrapped on the handle of both Type A and Type B holder. There shall by no flashover or breakdown of the insulation. Any discharge unaccompanied by a voltage drop shall be ignored.

5.3.6 *Test for Impact Strength*

5.3.6.1 *Impact test by vertical fall*

The holder shall be suspended by 1·5 m long welding cable appropriate size with the end of the head 1 m above a mild steel plate of at least 8 mm thickness lying on the ground.

The holder shall then be released to fall freely three times.

5.3.6.2 *Lateral impact test*

Flexible welding cable of appropriate size and 1·5 m in length shall be connected to the holder by means provided in the design of the holder. The holder shall be suspended vertically by this cable from a horizontal support against a shock piece fixed on a vertical plane as shown in Fig. 2. The suspension point shall be 1 000 mm above the apex of the shock piece.

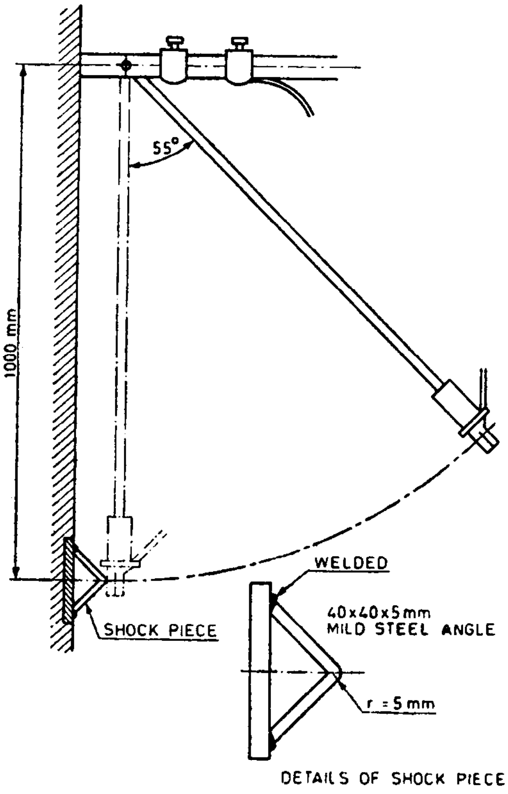


FIG. 2 LATERAL IMPACT TEST APPARATUS

The holder shall then be displaced from its vertical position such that the cable makes an angle of 55° to the vertical and released to fall on the shock piece.

This test shall be carried out six times; twice on the head, twice on the middle and twice on the lever.

The holder shall not be rendered unsafe as a result of these tests. The holder shall be in a working condition as a new one. Small splinters on superficial marks shall be ignored.

5.3.7 *Test for Flammability and Resistance to Heat*

5.3.7.1 The handle of the holder shall be placed horizontally and a rod of 18/8 chrome-nickel steel of 2·5 mm diameter and at least 100 mm length shall be placed above the handle at right angles to its axis. The arrangement is shown in Fig. 3.

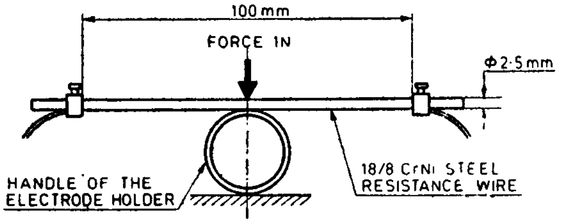

100 mm
FORCE IN
Φ2·5 mm
HANDLE OF THE ELECTRODE HOLDER
18/8 CrNi STEEL RESISTANCE WIRE

FIG. 3 ARRANGEMENT FOR FLAMMABILITY AND RESISTANCE TO HEAT

5.3.7.2 An electric current of 50 A shall be passed through the rod. When a steady thermal state is reached and the rod becomes incandescent, it shall be placed on the handle with a force of 1 N and attempt shall be made to ignite the gases which may be evolved in the region of the contact point with an electric spark or a small flame. This test shall be continued for 2 minutes.

5.3.7.3 The penetration into the handle caused by the rod shall be measured after removing the ribs or protrusions caused by burning. It shall not exceed 1·5 mm. The burning of gases, if flammable, shall stop as soon as the rod ceases to be incandescent.

5.4 Marking

The following information shall be legibly and indelibly marked on each electrode holder:

a) Name of the manufacturer and trade-mark, if any;

b) Letter *A* or *B* (according to type of holder) followed by rated current (that is, current at 60 percent duty cycle) and current at 30 percent duty cycle; and

c) Reference to this standard (Ref IS 2641).

Example:

A B C & Co Ltd

B 400/60% (Ref IS 2641)

This example is for an electrode holder of A B C & Co, Type B of this standard, rated 400 A at duty cycle of 60 percent.

6 RETURN CURRENT CLAMP

6.1 Design and Construction

6.1.1 Return current clamps shall be robust and shall be capable of maintaining efficient electrical and mechanical contact which cannot become disturbed in normal service.

6.1.2 If springs are used for securing the workpiece to the clamp, they shall not constitute any part of the current path.

6.1.3 Adequate means shall be provided for permanently connecting the clamp to the return cable of appropriate rating. The design shall preferably incorporate means to minimize the risk of damage to the cable due to flexing.

6.1.4 Return current clamp shall be plated to protect it from corrosion.

6.1.5 The preferred rated current shall be 200, 400 and 600 A.

6.2 Tests

6.2.1 *Routine Test*

Voltage drop test shall constitute the routine test.

6.2.2 *Voltage Drop Test*

Two clamps shall be used for this test, one attached to each end of a clean mild steel plate of size 300 mm × 75mm × 12 mm. A cable of appropriate size shall be connected to clamps by the means provided in the design of the clamps. A current equal to the rated current shall be passed through the clamps and the plate, voltage drop shall be measured between the plate and the cable end 12 mm clear of the connection. The value measured shall not exceed 0·12 V/100 A of the current passed.

6.3 Marking

The following information shall be legibly and indelibly marked on each return clamp:

a) Name of the manufacturer and trade mark, if any;

b) Rated current; and

c) Maximum and minimum size of the electrode.

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